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INVESTIGATIONS OF CROP DAMAGE BY WILD TURKEYS IN ILLINOIS

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INVESTIGATIONS OF CROP DAMAGE BY WILD TURKEYS IN ILLINOIS

FINAL REPORT

Federal Aid Project W-139-R-3

Submitted by:

Cooperative Wildlife Research Laboratory, SIUC

Presented to:

Division of Wildlife Resources
Illinois Department of Natural Resources

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FINAL REPORT

STATE OF ILLINOIS

W-139-R (1-3)

Project Period: 1 July 2000 through 30 June 2003

Project: Investigations of Crop Damage by Wild Turkey in Illinois

Prepared by Alan Woolf
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NEED: Some Illinois landowners and farm organizations have expressed concerns that increasing wild turkey (*Meleagris gallopavo*) populations are contributing to crop depredation, damaging common agricultural crops such as corn, wheat, soybeans, and milo. In addition, Illinois Department of Natural Resources (IDNR) personnel occasionally receive complaints of turkeys eating crops of various berries. As the turkey population continues to expand and increase in numbers, this issue will become more prominent. Flocks of turkeys utilizing agricultural fields tend to attract attention and turkeys may be blamed for depredation caused by other wildlife species. The IDNR Division of Wildlife Resources needs information about (1) the food habits of turkeys utilizing the agricultural landscape, (2) the frequency, seasonality, and severity of any crop depredation, (3) means of differentiating turkey damage from that caused by other wildlife species, and (4) methods for preventing turkey damage.

OBJECTIVES:

1. Investigate crop depredation complaints to determine whether turkeys or other species caused the damage and to characterize and quantify damage.
2. Investigate seasonal wild turkey food habits to characterize food use in Illinois' highly agricultural landscape.
3. Identify and test potential control measures to prevent or reduce depredation by wild turkeys and evaluate results.
4. Prepare guidelines for IDNR biologists to use in identifying/assessing reported turkey damage, and recommend measures to prevent or reduce depredation.

5. Prepare a brochure/pamphlet/booklet for public dissemination to educate landowners and the general public about turkey crop depredation, turkey diets, and damage prevention.

EXECUTIVE SUMMARY

Job 1.1. Damage Assessment

The objective of this job was to investigate crop depredation complaints to determine whether turkeys or other species caused the damage and to characterize and quantify damage. A thesis by Greene (2003) is appended in lieu of a final report for this job. Only 1 damage complaint attributed to turkeys was reported during the project and IDNR lacked records of others. We sampled 5 corn and 4 soybean fields for damage during the 2002 growing season; corn yield also was calculated. Samples of emerging soybean plants revealed 4.7% were damaged by either white-tailed deer or woodchucks. Most (96.5%) of damage was caused by deer, but the survival rate of deer-damaged plants was 94.2%. In contrast, none of the plants damaged by woodchucks survived.

Spring sampling of corn fields detected 0.4% of plants were damaged by either deer, birds, or insects; none were damaged by turkeys. Seventy-nine deer-grazed plants were found outside sample plots and monitored; survival was 91%. Fall samples revealed damage to 1.7% of ears examined. Most damage (58.8%) was caused by corn borers and stalk rot. Avian species (except turkeys), deer, and raccoon accounted for the remainder of damage. Calculated corn yield was 167.1 $\pm$ 27.5 bushels/ha. All damage sources combined accounted for a 1.3 bushel/ha reduction in yield.

Job 1.2. Seasonal Food Habits

The objective of this job was to investigate seasonal wild turkey food habits to characterize food use in Illinois' highly agricultural landscape. The purpose was to determine dietary importance of row crops to turkeys in landscapes where crop production dominated land use. Corn accounted for >45% of the foods found in spring 2002 crop and gizzard samples.

However, no unweathered seeds or seedlings of any agricultural crops were found and we concluded the corn represented waste from the previous harvest. Combined fall 2001 and spring 2002 data revealed >56% of the diet was agricultural crops; corn was 47.5% of the amount. Evidence indicated that both corn and soybeans present were consumed as waste grain.

Job 1.3. Depredation Control Measures

This job's objective was to identify and test potential control measures to prevent or reduce depredation by wild turkeys and evaluate results. Only 1 instance of reported damage occurred and we used that as an opportunity to test 1 control method. An inflatable scare device (Scarey Man, Clarratts LTD., Huntingdon, United Kingdom) was deployed along with scarecrows constructed by the landowner. Location of the devices was changed every 2-3 days. The landowner reported the problem solved within 10 days. To supplement this single test, a literature review and survey of Internet sites (included in this performance report) was conducted to identify and report on instances of depredation and potentially useful control methods.

Job 1.4. Analysis and Report

Objectives for this job were to (1) prepare guidelines for IDNR biologists to use in identifying/assessing reported turkey damage, and recommend measures to prevent or reduce depredation; and (2) prepare a brochure/pamphlet/booklet for public dissemination to educate landowners and the general public about turkey crop depredation, turkey diets, and damage prevention. The first objective was accomplished by meetings with agency staff and various performance reports, including this final report and appended documents. To achieve the objective of public education, we created a self operating PowerPoint presentation entitled *Types and Descriptions of Crop Damage in Illinois* suitable for distribution in compact disk format.

LITERATURE CITED

Greene, C. D. 2003. Use of agricultural habitats by wild turkeys (*Meleagris gallopavo*) in southern Illinois. Thesis, Southern Illinois University, Carbondale, USA.

STUDY 1. INVESTIGATIONS OF CROP DAMAGE BY WILD TURKEY IN ILLINOIS

Problem: Some Illinois landowners and farm organizations have expressed concerns that increasing wild turkey (*Meleagris gallopavo*) populations are contributing to crop depredation, damaging common agricultural crops such as corn, wheat, soybeans, and milo. As the turkey population continues to expand and increase in numbers, this issue will become more prominent. Flocks of turkeys utilizing agricultural fields tend to attract attention, and turkeys may be blamed for depredation caused by other wildlife species.

Objectives:

1. Investigate crop depredation complaints to determine whether turkeys or other species caused the damage and to characterize and quantify damage.
2. Investigate seasonal wild turkey food habits to characterize food use in Illinois' highly agricultural landscape.
3. Identify and test potential control measures to prevent or reduce depredation by wild turkeys and evaluate results.
4. Prepare guidelines for IDNR biologists to use in identifying/assessing reported turkey damage, and recommend measures to prevent or reduce depredation.
5. Prepare a brochure/pamphlet/booklet for public dissemination to educate landowners and the general public about turkey crop depredation, turkey diets, and damage prevention.

JOB 1.1. DAMAGE ASSESSMENT

Objective: Investigate crop depredation complaints to determine whether turkeys or other species caused the damage and to characterize and quantify damage.

A thesis by Greene (2003) is attached in lieu of a final report for Jobs 1.1 and 1.2. Following is the abstract of Greene's (2003) thesis:

Turkey (*Meleagris gallopavo*) distribution and population abundance have increased dramatically in the past several decades. Agricultural habitats, for instance, have been shown capable of supporting dense populations of turkeys. As with any species, noticeable increases in populations draw attention to possible detrimental effects. Several midwestern states have

studied the perceived or real damage caused to agricultural crops by turkeys. Continuing complaints from Illinois farmers and landowners prompted the Illinois Department of Natural Resources to investigate turkeys and their role in agricultural landscapes in Illinois. Therefore, I studied food habits, habitat use, and damage to row crops in order to determine if turkeys were causing damage to corn and soybeans in southern Illinois. Crops and gizzards were collected from hunter-harvested turkeys from the fall 2001 and 2002, and spring 2002 hunting seasons. Corn and soybeans were present, but consumed as waste grain; during both seasons, no harvestable agricultural food items were present in any samples. In March 2002, 6 turkeys were radioed and monitored via triangulation and radiomonitoring. These data revealed that turkeys did not use habitats in proportion to availability ($P < 0.05$), such that forests were selected, crop fields were avoided, and grassland use was neutral. There was no differences in pre- vs. post-planting habitat use for either method. I sampled 4 corn and 4 soybean fields for wildlife damage in spring 2002. Corn damage differed between species ($P < 0.05$), with insects causing the most damage. Soybean damage also differed between species ($P < 0.05$), with deer causing the most damage. I sampled 5 corn fields in fall 2002 for wildlife damage and also estimated yield for each field. Corn borer damage was combined with stalk rot damage and accounted for the greatest yield loss by species. Similar to other studies in the agricultural midwest, turkeys caused no definitive damage to crops in southern Illinois.

JOB 1.2. SEASONAL FOOD HABITS

Objective: Investigate seasonal wild turkey food habits to characterize food use in Illinois' highly agricultural landscape.

See attached thesis (Greene 2003) and abstract under Job 1.1.

JOB 1.3. DEPREDATION CONTROL MEASURES

Objective: Identify and test potential control measures to prevent or reduce depredation by wild turkeys and evaluate results.

There were no reports of turkey damage to agricultural crops or ornamental plantings in Illinois Department of Natural Resources (IDNR) archives and agency biologists were only able to recall few anecdotal instances. During the study, we received 1 report of turkey damage; turkeys were foraging in an area of newly sown grass seed. We visited the site with M. Murphy (IDNR District Wildlife Biologist) and recommended that an inflatable scaring device (Scarey Man, Clarratts LTD., Huntingdon, United Kingdom) be deployed along with scarecrows constructed by the landowner. Location of the devices was changed every 2-3 days. The landowner reported the problem solved within 10 days and no further incidents of damage occurred.

In the absence of opportunity to test potential control measures, we carefully reviewed literature and selected Internet sites to identify actions taken by others and their outcomes. Results of those reviews follow Job 1.4.

JOB 1.4. ANALYSIS AND REPORT

Objectives: (1) Prepare guidelines for IDNR biologists to use in identifying/assessing reported turkey damage, and recommend measures to prevent or reduce depredation; and (2) prepare a brochure/pamphlet/booklet for public dissemination to educate landowners and the general public about turkey crop depredation, turkey diets, and damage prevention.

Meetings with agency staff, Annual Performance Reports, this Final Performance Report, and the appended thesis (Greene 2003) meet the first part of this job's objectives. An appended compact disk is a self operating PowerPoint presentation entitled *Types and Descriptions of Crop Damage in Illinois*. This medium was selected for public dissemination because of cost effectiveness given the widespread professional and public use of personal computers.

LITERATURE CITED

Greene, C. D. 2003. Use of agricultural habitats by wild turkeys (*Meleagris gallopavo*) in southern Illinois. Thesis, Southern Illinois University, Carbondale, USA.

BIBLIOGRAPHY WITH SELECTED ANNOTATIONS

Home range, habitat use, and food habits of the wild turkey (*Meleagris gallopavo*) with special emphasis on brood-rearing, agricultural habitats, and crop depredation: A bibliography with selected annotations.

CROP DEPREDATION

Conover, M. R. 1998. Perceptions of grass-roots leaders of the agricultural community about wildlife damage on their farms and ranches. Wildlife Society Bulletin 22:94-100.

Craven, S. R. 1988. The impact of wildlife damage on wildlife management programs in Wisconsin. Proceedings of the Vertebrate Pest Conference 13:9-13.

Animal damage problems continue to increase and must be considered in current wildlife management programs. Real or potential levels of damage by several wildlife species has become a major component of determining populations and harvest regulations in Wisconsin. The author examined the historic and current issues concerning damage caused by Canada geese (*Branta canadensis*), white-tailed deer (*Odocoileus virginianus*), double-crested cormorants (*Phalacrocorax auritis*), and wild turkeys (*Meleagris gallopavo*) in Wisconsin. Important points to consider include: comparing the severity of loss to the economic benefit of the wildlife, examining the number of farmers affected, accurate reporting of losses, and assigning responsibility for compensation of damage caused by a public resource.

_____. 1989. Farmer attitudes toward wild turkeys in southwestern Wisconsin. Proceedings of the Eastern Wildlife Damage Control Conference 4:113-119.

The Wisconsin Department of Natural Resources initiated a research project to determine the role wild turkeys play in crop damage following concerns that increasing complaints of damage and associated media publicity could affect management decisions relative to wild turkeys. Mail surveys were developed based on interviews with landowners that filed complaints of crop depredation by turkeys. Surveys were mailed to 508 farmers chosen randomly from county farm bureau lists, 91 members of Wisconsin Woodland Owners Association (WWOA), and the 31 farmers contacted for the pre-survey interview. Most respondents reported seeing turkeys on their property within the previous year. Fall was the season in which most respondents (60%) reported seeing the greatest number of birds. Most respondents favored an increase in turkey populations over stable populations. Turkeys were not perceived as a problem by 86% of WWOA members that farmed their land, but farmers were less tolerant of turkeys (51%). Only 14% of farmers said they could accurately assess damage caused by turkeys. Corn was the most frequently reported damaged crop, especially during fall. Alfalfa and oats were reportedly damaged during spring and summer. Perceived damage included seed pulling, trampling, and scratching. Economic losses were reported by 45% of farmers, but only 9 exceeded $500, 50% reported no economic loss, and 5% reported economic benefits (controlling weeds, eating insects). Extrapolation of reported economic losses was estimated between $500,000-750,000. Farmers perceived the increase in crop damage was mainly due to “more turkeys” rather than late harvest, poor weather, or poor mast crop. Most respondents favored increased harvest as a solution.

Gabrey, S. G. 1991. Wild turkeys and agriculture in northeastern Iowa. Thesis, Iowa State University, Ames, Iowa, USA.

This study was conducted to determine Iowa landowner attitudes and perceptions of the role of wild turkeys in crop damage and to determine wild turkey use of corn and oats crops. Landowner attitudes were determined through a mail survey (survey included in thesis as an appendix). Radio-collared turkeys were monitored and birds were observed in 2-hour time blocks when located in crop fields. Corn and oat fields were examined to determine extent of turkey damage. Crops were collected from harvested birds during the spring hunting season for food-habits analysis. Mature corn fields were checked during fall to determine damage and wildlife species responsible. Of the 337 respondents, 64% reported damage by turkeys. The greatest damage reported was to corn (88%), then oats (42%), and hay (24%), but the amount of damage varied seasonally. Economic losses were reported mostly between $1-500; however, 17% of respondents reported some gain (not necessarily financial) from the presence of wild turkeys. Most landowners preferred an increased harvest as a solution to damage. Field observations revealed wild turkeys used crop fields, but rarely damaged plants; most damage was cause by deer or squirrels. Only 2.3% of damage to mature corn was attributed to wild turkeys, but those ears were still able to be harvested. There was no difference in the number of mature ears of corn damaged among all crop fields examined; however, the number of ears damaged decreased as the distance from the field edge increased. While many respondents reported some damage to crops very few (n = 4) filed complaints to state biologists, indicating little confidence in deterring further damage or landowners are tolerant of some crop damage. Field observations suggested turkeys do little damage to crops and are likely attracted to these areas because of the abundance of insects. Wild turkeys are large birds that are active during the day and travel in flocks, thus making them highly visible. Turkeys are often circumstantially implicated in damage to crops based primarily on their highly visible nature and the inability of many landowners to properly assign blame.

_____, P. A. Vohs, and D. H. Jackson. 1993. Perceived and real crop damage by wild turkeys in northeastern Iowa. Wildlife Society Bulletin 21:39-45.

This study used a mail survey to determine Iowa landowner attitudes toward wild turkeys and their role in damage to agricultural crops and field observations to determine how turkeys use crop fields. The survey was distributed to 457 landowners and contained 15 questions pertaining to their perceptions of crop damage caused by wild turkeys and other wildlife species. A second survey was sent to nonrespondents within 4 weeks. Of the 337 respondents, 64% reported damage by turkeys. The greatest damage reported was to corn during the fall (31%), then oats (24%), and hay (13%) during the summer. Economic losses were reported mostly between $1-500. Most landowners preferred an increased harvest as a solution to damage. For the field observations, turkeys were observed in corn and oat fields to document activity during the early and late growing season. During spring, turkeys were observed <2% in crop fields. Turkeys were observed pecking, but no evidence of damage caused by turkeys was seen. During fall, 2.3% of mature ears of corn examined had been damaged by turkeys, but were determined harvestable. Most landowners seemed to tolerate some damage caused by turkeys, but still viewed turkeys as a threat to crops. Field observations suggested turkeys do little damage to crops and are likely attracted to these areas because of the abundance of insects. It was concluded that because turkeys are gregarious, their high visibility lent to the perception that they were damaging crops. Losses surveyed by landowners were most likely misidentified and wrongfully blamed on turkeys.

Miller, J. E., B. C. Tefft, M. Gregonis, and R. E. Eriksen. 2000. Wild Turkeys and agricultural damage: real or perceived/thresholds and tradeoffs. Proceedings of the Vertebrate Pest Conference 19: 58-62.

Increasing wild turkey populations have the potential to cause considerable damage to agricultural crops. Recent research indicates wild turkeys are perceived to cause more damage to crops than is actually occurring. This paper presents preliminary data of a survey of all state fish and wildlife agencies, all state cooperative extension services, and state supervisors for USDA-APHIS regarding complaints of wild turkey damage. Responses represent 39 of the 50 states and a 36% response rate out of 170 surveys. Wild turkey complaints were received in 37 of 39 states responding with 28 states confirming turkeys were responsible for some damage. Fourteen states reported 76-100% of damage reported was caused by species other than turkeys. Crops reported to receive confirmed damage include corn, silage, hay, and tomatoes. Seven states report turkey complaints are increasing. Expenditures by wild turkey hunters in 6 states (AZ, MO, MN, PA, SC, and WV) averaged $12.3 million annually, whereas the average cost of wildlife agencies in these 6 states to manage turkey populations was $89,707, annually. Most complaints of crop damage are unfounded: however, wild turkeys do cause some damage although economic loss is generally minimal.

Payer, D. C., and S. R. Craven. No date. Wild turkeys: a problem for Wisconsin farmers? University of Wisconsin Cooperative Extension Publication G3623.

An excellent publication that addresses concerns that landowners in Wisconsin were having relative to crop depredation by wild turkeys. The publication provides a summary of habitat use and food-habits studies conducted by Wisconsin Department of Natural Resources personnel (see Craven 1989, Wright et al. 1989, Paisley and Kubisiak 1994) that can be easily understood by non-biologists. A section is provided that allows landowners to consider the different factors involved in determining what is wildlife damage and how to determine which species of wildlife is responsible. Alternatives to prevent or control wildlife damage are offered.

Schorger, A. W. 1966. The wild turkey: it's history and domestication. University of Oklahoma Press, Norman, Oklahoma, USA.

A good resource for general turkey information, but pages 217-219 contain a subheading: Destruction of Agriculture Crops" in the Feeding Habits and Foods chapter. It says that wild turkeys frequently damaged the crops of early settlers. In West Virginia, a guard was placed on duty to prevent turkeys from destroying crops. In Crawford County, Illinois, prairie chickens and turkeys destroyed so much corn that hunts were organized to exterminate them. Another extermination hunt was organized in Sangamon County, Illinois. Other accounts of crop-destroying turkeys are presented and citations for all accounts are provided.

Swanson, D. A., G. E. Meyer, and R. J. Stoll, Jr. 2001. Crop damage by wild turkeys in Ohio. Proceedings of the National Wild Turkey Symposium 8:in press.

Real versus perceived crop damage by wild turkeys in Ohio was addressed using phone interviews and field investigations. Turkeys were reported being seen on 34% of all interview respondents' farms with >75% reporting no damage within the previous 12 months (western, northeastern, and intermediate regions of Ohio). Wild turkeys were perceived as a potential problem in southeastern Ohio, where turkey populations were highest and farm production was lowest. Farmers believed most damage was caused by turkeys during spring, followed by fall, summer, and winter. Twenty-six turkey crop damage complaints were investigated, of which

only 3 cases were verified as damage caused by turkeys. No further damage was reported after deterrents (i.e., using less attractive mulch, stringing Mylar® tape around garden border) were implemented. Damage by other wildlife and poor planting conditions were contributors to crop losses in the remaining cases. It was concluded that turkeys are attracted to agricultural areas by the invertebrate fauna rather than crops. A crop damage manual and educational program were developed to aid in correctly identifying causes of crop damage and has resulted in a decrease in the number of complaints about wild turkeys.

Wywialowski, A. P. 1994. Agricultural producers' perceptions of wildlife-caused losses. Wildlife Society Bulletin 22:370-382.

_____. 1998. Are wildlife-caused losses of agriculture increasing? Proceedings of the Vertebrate Pest Conference 18:363-370.

FOOD HABITS

Barwick, L. H., W. M. Hetrick, and L. E. Williams, Jr. 1973. Foods of young Florida wild turkeys. Proceedings of the Southeastern Association of Game and Fish Commissioners 27:92-102.

Stomachs and crops were collected from 75 turkey poults (1-164 days old) during April through October. Presence of corn in crop samples was dismissed as bait corn. Plant foods occurred in 85.7% and 93.9% of poult (aged 1-14 days and 5-164 days, respectively) crops and comprised 75% and 72.8%, respectively, of the volume of all foods consumed. Animal foods, mostly insects, occurred in 61.9% and 63.9% of poult (aged 1-14 days and 5-164 days, respectively) crops. The amount of animal foods was similar to another study of summer foods of juvenile turkeys, but considerably lower than has been reported for bobwhite quail (*Colinus virginianus*) and ruffed grouse (*Bonasa umbellus*).

Baughman, W. M., and D. C. Guynn, Jr. 1993. Wild turkey food habits in pine plantations in South Carolina. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 47:163-169.

Food habits of wild turkeys in South Carolina were determined from analysis of 1,576 droppings. A weakness of this study is that percent volume of food items in a dropping was visually estimated rather than determined by volumetric displacement. Plant material made up the bulk of food items during all seasons (91% in spring, 91% in summer, 87% in fall, and 92% in winter). Grasses occurred in all samples in all seasons. Forbs occurred in all samples during all seasons except winter (90%). Diet did not differ by sex. The high presence of grasses and forbs suggests forest openings or forest management practices that encourage herbaceous understory growth are essential in habitat management for wild turkeys.

Beasom, S. L., and O. H. Pattee. 1978. Utilization of snails by Rio Grande turkey hens. Journal of Wildlife Management 42:916-919.

Consumption of snails for calcium has been reported for egg-laying waterfowl. This study looked at snail consumption by egg-laying and incubating female wild turkeys (subspecies *M. gallopavo intermedia*). Crop contents were collected from female turkeys and snail and snail shell volume was determined by volumetric displacement. Abundance of snails and snail shells was visually estimated at collection areas. There were no differences in abundance between

years or areas. Laying females consumed roughly 9 times more snails than did pre-laying and post-laying females. It was concluded that snails and snail shells consumption was greatest by egglaying females; hence, they are an important source of calcium for egg formation.

Blackburn, W. E., J. P. Kirk, and J. E. Kennamer. 1975. Availability and utilization of summer foods by eastern wild turkey broods in Lee County, Alabama. Proceedings of the National Wild Turkey Symposium 3:86-96.

Vegetation sampling and fecal content analysis were used to determine the availability and use of foods by turkey poults during summer. Seedheads were collected from plots located in permanent openings and other food items were collected from the litter layer in forested areas. Food items in June and July were collected up to a height of 30.5 cm and up to 45.7 cm during August and September (presumably to reflect the height to which poults could feed). Insects were collected with sweep nets. Fresh droppings were collected from poults in areas where brood groups had been observed for at least 30 minutes. Seedhead production ranged from 1.00 kg/ha (abandoned rowcrop) to 94.71 kg/ha (improved pasture) in June, declined throughout the summer and increased during September. Insects collected were mostly grasshoppers. American beech (*Fagus grandifolia*) mast was the most available food item in forest litter, but only occurred in bottomland hardwoods. Blackberries (*Rubus* spp.) were generally the most abundant soft fruit food. Few droppings were collected in June and July, but there was an apparent shift in vegetation consumed. Blackberries were most prevalent in droppings during June and July, but shifted to carpet grass (*Axonopus affinis*) in August and crab grass (*Digitaria* spp.) in September. Vegetation comprised 91% of poult droppings. This value was much higher than reported for other gallinaceous birds, but there was no discussion of differences in digestibility of food items. Poults generally consumed foods in proportion to their abundance, except carpet grass seeds were consumed in greater proportion than their availability. The authors concluded that grassy openings were an essential habitat component for brood production.

Dalke, P. D., W. K. Clark, Jr., and L. J. Korschgen. 1942. Food habit trends of the wild turkey in Missouri determined by dropping analysis. Journal of Wildlife Management 6:237-243.

This study was one of the first to use droppings to determine year-round food use by wild turkeys, noting that crop and gizzard collections were difficult to obtain throughout the year. Plant foods comprised 76.1% of the annual diet, although there were seasonal variations which were suspected to be due to fluctuations in abundance and availability. *Digitaria*, *Paspalum*, and *Quercus* were the most important plant foods; however, 73% and 61% of all plants consumed occurred in the lowest frequency groups during spring-summer and fall-winter, respectively. Consumption of grass, leaves, and seeds was highest between July-October and between November-April for acorns. Consumption of insects was highest between April-October. Beetles were the most frequently consumed insect during spring-summer and grasshoppers were the most frequently consumed insect during fall-winter.

Dickson, J. G. 1990. Oak and flowering dogwood fruit production for eastern wild turkeys. Proceedings of the National Wild Turkey Symposium 6:90-95.

Eaton, S. W., T. L. Moore, and E. N. Saylor. 1970. A ten-year study of the food habits of a northern population of wild turkeys. Science Studies 26:43-64.

This food habits study was conducted to help explain the range extension of wild turkeys through Pennsylvania into New York. Droppings were collected throughout the year and some

crops and gizzards were collected during fall. Droppings were moistened, strained, and proportions of various food items were visually estimated. Hard mast dominated diets in fall and winter and sedges and grasses were consumed most during spring and summer. There is a month by month breakdown of foods consumed. Some food habits were surmised from notes and observations following turkey tracks in the snow. The main conclusion was that wild turkeys are adaptable in their feeding habits relative to seasonal availability of foods.

Glover, F. A., and R. W. Bailey. 1949. Wild turkey foods in West Virginia. Journal of Wildlife Management 13:255-265.

Droppings (n = 4,249) were collected opportunistically between July-April. Data were compiled and analyzed to determine what foods were consumed during a harsh winter in West Virginia, following a season of poor mast production. Vegetable matter made up 98.3% of the total volume of food. Oats and corn were consumed most frequently, but these foods were available following an emergency winter feeding program. Beechnuts were an important food between October-January and again in April. Snow depth likely limited the availability of beechnuts in February-March. Dogwood (*Cornus florida* and *C. amomum*) fruits were also heavily consumed between October-February. Wild turkeys were characterized as nomadic feeders – sampling a wide variety of foods based upon abundance and availability – although major food items consumed are generally high in fat and protein, thus considered nutritionally superior.

Hamrick, W. J., and J. R. Davis. 1971. Summer food items of juvenile wild turkeys. Proceedings of the Southeastern Association of Game and Fish Commissioners 25:85-89.

Food habits were determined from crop contents collected from 21 juvenile wild turkeys (aged 45-105 days). Vegetation comprised 73.2% of the total volume and was dominated by 6 grass species. Insects made up 23.6% of all animal matter. Based on food habits of other gallinaceous birds, it was speculated that insect consumption would be higher in birds younger than 45 days. The authors concluded that grassy openings were an important habitat component for brood rearing.

Healy, W. M. 1985. Turkey poult feeding activity, invertebrate abundance, and vegetation structure. Journal of Wildlife Management 49:466-472.

This study was developed to define brood habitat of wild turkey poults for easy inventory and proper management. Two broods of human-imprinted poults were observed in forested and open areas to determine feeding activity. Vegetation was sampled along transects and clippings were collected to determine biomass. Invertebrates were collected using a sweep net. Broods did not differ in activities, but activities varied among sites. Feeding rate was positively correlated with invertebrate abundance, invertebrate weight, herbaceous species per plot, total species per plot, and herbaceous vegetation dry weight. Poults consumed more vegetation in forest areas than in open areas, but invertebrates were the major food item consumed. Consumption of plant material increased with poult age. Composition of invertebrates consumed was generally similar to the composition collected in sweep nets. The proportion of invertebrates consumed was higher than reported values for crop content analysis (see Hamrick and Davis 1971 and Barwick et al. 1973). Differences could be due to geographic variance in invertebrate composition or sampling techniques. Feeding activity was greatest in clearings, but forest areas with the proper composition of ground cover (>50%), total cover (60-100%), and understory canopy height (20-60 cm tall) can provide adequate invertebrate foods to young poults.

Hurst, G. A. 1978. Effects of controlled burning on wild turkey poult food habits. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 32:30-37.

_____. 1992. Foods and feeding. Pages 66-83 *in* J. G. Dickson, editor. The wild turkey: biology and management. Stackpole Books, Harrisburg, Pennsylvania, USA.

_____, and B. D. Stringer, Jr. 1975. Food habits of wild turkey poults in Mississippi. Proceedings of the National Wild Turkey Symposium 3:76-85.

Captive turkey poults (aged 3-38 days) were allowed to feed in sample habitats and then killed to examine foods in the gastro-intestinal tract. Poults were allowed to feed for 3-7 hours and 2 broods were run in the same habitat on the same day. During the first year (1973) the animal to plant food ratio was 70:30 for poults 3-7 days, 43:57 for poults 8-14 days, 34:66 for poults 15-21 days, and 13:87 for poults 22-24 days. Insects comprised 80.2% of the animal matter. Seeds of sedges, dewberry, and forbs were the 3 most important plant foods. During the second year (1974) poults were run with either a broody chicken or a female turkey. Most of the poults with the female turkey were aged 3-7 days and consumed 77% animal matter. Animal to plant ratios for poults with the broody chicken were 79:21 for 3-7 day poults, 54:46 for 8-14 day poults, 37:63 for 15-21 day poults, and 13:87 for 22-38 day poults. Insects made up 87.4% of all animal matter consumed. Dewberry, sedges, and nut-rush were the dominant plant foods. Some poults were run with a radio-collared female turkey and allowed to feed in areas selected by the female. These poults consumed >90% animal matter when 3-7 days, but consumed only 66% when 22-38 days. The shift from high animal consumption to low animal consumption has been reported for other gallinaceous birds. Poults feeding in open areas (pastures, roadsides, or hayfields) were able to consume more animal foods than poults in other habitats.

_____, and C. N. Owen. 1980. Effects of mowing on arthropod density and biomass as related to wild turkey brood habitat. Proceedings of the National Wild Turkey Symposium 4:225-232.

Kennamer, J. E., J. R. Gwaltney, and K. R. Sims. 1980. Food habits of the eastern wild turkey on an area intensively managed for pine in Alabama. Proceedings of the National Wild Turkey Symposium 4:246-250.

Kirkpatrick, R. D., M. R. Roy, G. A. Wise, and L. L. Hardman. 1972. Contents of southern Indiana wild turkey droppings. Proceedings of the Indiana Academy of Science 81:165-168.

Dropping analysis was used to determine the food habits of 207 adult and 84 juvenile wild turkeys in Indiana. Plant seeds comprised the majority of the diet of both juvenile and adult birds throughout the year, but were markedly lower during fall and winter. The amount of seeds from *Cornus* spp., *Quercus* spp., and *Smilax* spp. was highest in fall and winter diets. Insects appeared to be more important to juveniles than adults.

Korschgen, L. J. 1970. April foods of wild turkeys in Missouri. Missouri Department of Conservation Job Completion Report 13-R-24.

Crops and gizzards were collected from 698 male turkeys during April hunting seasons in 1960 and 1963-1965. One hundred one different plant foods and 35 different animal foods were identified. Acorns made up 49.8% of all foods consumed. Waste and bait corn comprised 12.4% of the volume of foods consumed; whereas, oats (suspected as bait) were in 3.2% of all samples.

Food habits of 16 accidentally or illegally harvested female turkeys showed acorns (52.6%), waste or bait corn (10.6%), and wheat (6.4%; but only from 1 bird). Wild turkeys in Missouri used a wide variety of food items, many of which are found in forest clearings and small fields. This was one of the few studies that acknowledges possible biases resulting from differences in digestibility of foods.

Lancia, R. A., and W. D. Klimstra. 1978. Contents of wild turkey droppings collected in winter on Crab Orchard National Wildlife Refuge. Transactions of the Illinois Academy of Science 71:422-426.

Wild turkey winter food habits were determined from droppings collected under roosts. Thirty-five plant species were identified and dominant food items were waste corn, acorns (*Quercus* spp.), and loblolly pine (*Pinus taeda*) nuts. The authors concluded that the dependency on corn indicated poor habitat quality for wild turkeys.

Martin, D. D., and B. S. McGinnes. 1975. Insect availability and use by turkeys in forest clearings. Proceedings of the National Wild Turkey Symposium 3:70-75.

Domestic turkey poults, reared by wild turkey females, were observed in forests and forest clearings to determine the use of available insects. Insects were collected using an invertebrate sampling vacuum. Poults were released into the different habitats and were allowed to feed for at least 5 hours before being killed. Crops and gizzards were removed and examined for contents analysis. Insects were 25 times more abundant in forest clearings, but the amount of invertebrates consumed generally did not differ from the amount consumed in closed canopy forest. Consumption of plant material increased with age of the poults. Invertebrates collected and consumed contained more crude protein and calories than did vegetation. Wild turkey poults could obtain the necessary amount of protein from insects in forested areas, but may be attracted to clearings by the greater abundance of insects and vegetation.

Paisley, R. N., R. G. Wright, and J. F. Kubisiak. 1996. Use of agricultural habitats and foods by wild turkeys in southwestern Wisconsin. Proceedings of the National Wild Turkey Symposium 7:69-73.

Complaints that wild turkeys were causing damage to agricultural crops prompted this study to determine use of agricultural habitats and foods in Wisconsin. Radio-collared female turkeys were monitored during summer and fall. Food habits were determined by collecting digestive tracts from turkeys observed feeding at least 20 minutes in crop fields. During fall, digestive tracts were collected from hunter-harvested birds. Females generally used crop fields more in the summer than fall. During summer, females with broods used crop fields more and forested areas less than females without broods. This data is counter to that presented in earlier works (see Wright et al. 1989). Agricultural foods made up 69% (mostly waste corn) of the spring diet. No corn seedlings were consumed. Other crops consumed included alfalfa, oat seeds, and soybeans. During summer, brood flocks consumed mostly grasshoppers (68%) with poults consuming more animal matter than did adults (77% vs. 4%). Adult females consumed more oat seeds than did poults (65% vs. 23%). Agricultural crops dominated fall diets (49%) with waste corn accounting for 39% of the total volume. It was suggested that a poor production of hard mast contributed to the low occurrence (12%) of this food item during fall. The authors concluded that agricultural habitats were important to wild turkeys, and that although damage to crops likely occurs, the consumption of agricultural crops was low.

Pattee, O. H., and S. L. Beasom. 1981. A partial nutritional analysis of wild turkey hen diets in springtime. Proceedings of the Southeastern Fish and Wildlife Agencies 35:225-232.

This study investigated the nutritional quality of foods consumed by female wild turkeys during the breeding season. Food habits data were determined from crop contents of 4 female wild turkeys collected every 22 days during February through May in 2 consecutive years (1975 and 1976). Simulated diets were constructed within 3 days of the collection of the bird to compare nutritional quality against the crop-collected diets. Plant foods made up 48-98% of female turkeys spring diet. Green vegetation was important in February, but consumption of fruits and seeds was generally higher during March through May. The amount of insects collected from crops generally increased throughout spring. The amount of protein, calcium, and phosphorus in crop-collected diets was relatively stable throughout the collection period, but peaked in late April. Simulated diets were generally lower in crude protein than crop-collected diets, but similar in calcium and phosphorus. Plant foods provided most of the nutritional value during February and March, but importance shifted to animal matter during April and May. The authors concluded that a wild turkey diet consisting primarily of plant foods would not be sufficient to meet dietary guidelines prescribed for breeding domestic turkeys.

Schemnitz, S. D. 1956. Wild turkey food habits in Florida. Journal of Wildlife Management 20:132-137.

Food habits were assessed from 32 crops and 60 dropping lots (5-160 droppings) collected from areas near turkey feeders and under roost trees. Percent composition of food items was quantified from visual estimate. Additionally, a vegetation survey of ground cover was conducted to evaluate habitat in 8 habitat types. Ten food items made up 92.8% of all foods identified from crop analysis. Acorns ranked highest in number, weight, and volume followed by *Paspalum* spp. and *Panicum* spp. seeds. Plant foods made up 97.1% of all food items. Grass leaves were most abundant in droppings followed by *Paspalum* spp. and *Panicum* spp. seeds. There was some seasonal variation in the foods consumed. Corn consumption at feeders increased during fall and winter and corn may be an important food supplement. The amount of grass in the turkey diets suggests forest openings and grasslands are important. Results and discussion of the vegetation study were limited, but suggested some habitats offer a greater variety of plant foods than others.

Tabatabai, F. R., and M. L. Kennedy. 1984. Spring food habits of the eastern wild turkey in southwestern Tennessee. Journal of the Tennessee Academy of Science 59:74-76.

Gizzards were collected from 87 hunter-harvested birds over 3 consecutive spring seasons. Food volumes of 38 food types were determined. Sugar hackberry (*Celtis laevigata*) was the highest ranked food item in both volume and frequency (53.9% and 77.2%, respectively). Other important foods were bristle grass (*Setaria* spp.), oak (*Quercus* spp.) and American beech (*Fagus grandifolia*) mast, and flowering dogwood (*Cornus florida*), although their relative importance varied annually.

HABITAT USE

Baker, B. W., S. L. Beasom, and N. J. Silvy. 1980. Turkey productivity and habitat use on south Texas rangelands. Proceedings of the National Wild Turkey Symposium 4:145-158.

Chamberlain, M. J., and B. D. Leopold. 2000. Habitat sampling and selection by female wild turkeys during preincubation. Wilson Bulletin 112:326-331.

Day, K. S., L. D. Flake, and W. L. Tucker. 1991. Movements and habitat use by wild turkey hens with broods in a grassland-woodland mosaic in the northern plains. Prairie Naturalist 23:73-83.

Habitat characteristics influencing selection of brood rearing areas by wild turkeys in South Dakota were studied by monitoring radio-collared females. The study area was dominated by mixed and short-grass prairie (52.4%), followed by hardwood forest (30.8%), agricultural land (15.9%), and farmstead (0.9%). Home ranges were calculated using the minimum area method and superimposed on cover maps. Visual observations of broods were made every 3-4 days and locations were plotted on topographic maps. Habitat characteristics were surveyed at each visually verified location. Seventeen broods were monitored during 3 brood rearing periods (Age1: hatch-4 weeks, Age2: 4-12 weeks, Summer: hatch until mid-August; up to 12 weeks) over 2 years. After monitoring females with broods 2 movement patterns emerged. The first was a nearly direct movement away from the nest to the summer area (roughly 2 weeks after hatch) with a mean dispersal distance of 1.9 km. The second was a series of gradual movements which lead to slow expansion to the summer area with a mean dispersal distance of 0.7 km. Age1 broods had smaller home ranges (42.1 ha) than Age2 broods (126.7 ha). Home range was 198.2 ha when both brood groups were combined. The proportion of habitat types used did not differ between broods or age groups. Surveys of habitat characteristics showed grassland areas had greater forb cover than grass; soft fruit and arthropods were more abundant in areas used by Age1 broods than Age2 broods. Woodland use was mostly near habitat edges and Age1 broods used sites with less fruit and more arthropods than Age2 broods. Small home ranges suggested that a nearly 50:50 woodland:grassland ratio is adequate for brood rearing by wild turkeys. Complexity of habitat structure may be more important for younger broods for protection from predation and weather.

Glennon, M. J., and W. F. Porter. 1999. Using satellite imagery to assess landscape-scale habitat for wild turkeys. Wildlife Society Bulletin 27:646-653.

This study looked at the feasibility of using satellite imagery to assess habitat suitability for wild turkeys in southwest New York. The analysis revealed most land-cover types important to wild turkeys can be ascertained by satellite imagery (accuracy = 84%). When comparing habitat classifications to indices of turkey abundance, areas with greater fragmentation (i.e., interspersion of forest and open areas) supported larger turkey populations.

Hayden, A. H. 1979. Home range and habitat preferences of wild turkey broods in northern Pennsylvania. Transactions of the Northeast Fish and Wildlife Conference 36:76-87.

Female wild turkeys with broods were monitored to determine home range and habitat use in northern Pennsylvania. Average home range was 93 ha; however, the center of activity for several broods shifted because of human disturbance, formation of multiple brood flocks, and changes in food resources. Broods used savannah (defined as grassland with trees, but the density of trees is so low that grass and forbs are the dominant plant community) most (50%), followed by forest (37%), open fields (11%), and cultivated fields (1.5%). Savannahs with >50% canopy crown were used more often than those <50% canopy crown. The composition of the tree species did not necessarily influence brood use, although management of species that provide adequate crown cover, yet allow herbaceous plant growth, was recommended.

Katibah, E. F. 1978. Remote sensing-aided assessment of wild turkey habitat. National Wildlife Federation Scientific and Technical Series 4:78-81.

Keegan, T. W. 1997. Brood-rearing habitat use by Rio Grande wild turkeys in Oregon. Great Basin Naturalist 57:220-230.

Kurzejeski, E. W, and J. B. Lewis. 1990. Home ranges, movements, and habitat use of wild turkey hens in northern Missouri. Proceedings of the National Wild Turkey Symposium 6:67-71.

Wild turkey density in woodlands in the Midwest can exceed 30 bird/km^2 and it is thought that row crop agriculture is a major influence in maintaining high turkey densities. Radio-tagged female turkeys were monitored to determine annual habitat use and home range. Mean annual home range was 779.9 ha. There was no difference detected in seasonal home range within or between years, but there was a difference in habitat use. Cropland use between years was higher during the first year (34%) than the second year (6%). Conversely, woodlands and old fields were used less during the first year (45% and 14%, respectively) than the second year (60% and 28%, respectively). Distance from the center of the winter home range to the nesting location was 1.4 km. Nest sites were most common in old fields (65%), woodlands (23%), pasture (10%), and cropland (3%). Females with broods used pastures more than females without broods, but use of croplands did not differ between the 2 groups. High use of croplands during winter of the first year could be a function of low acorn production, although croplands used most often were bordered by mature woodlands. Although croplands may be important to wintering turkeys, the importance of croplands may only be secondarily related to acorn production, thus supporting the idea that shifts in seasonal home range and habitat use may be related to food availability. Habitat use data suggested a 50:50 mix of hardwood and open land provided ideal habitat for wild turkeys.

Little, T. W. 1980. Wild turkey restoration in "marginal" Iowa habitat. Proceedings of the National Wild Turkey Symposium 4:45-60.

Only 7% of Iowa's land surface is forested, and 99% of that forested land is in private ownership. These forest tracts are interspersed throughout agricultural lands and most are not managed properly for wildlife. This paper documents successes and failures in the turkey reintroduction program in Iowa. It examines reasons for failures, present stocking procedures, and current population status. It is often cited that wild turkeys require extensive tracts of standing timber, yet wild turkeys thrive in a landscape without this critical habitat component. The author concluded that wild turkeys are more adaptable and can take advantage of a greater variety of habitat configurations than previously considered.

Miller, D. A., G. A. Hurst, and B. D. Leopold. 1999. Habitat use of eastern wild turkeys in central Mississippi. Journal of Wildlife Management 63:210-222.

Pack, J. C., R. P. Burkert, W. K. Igo, and D. J. Pybus. 1980. Habitat utilized by wild turkey broods within oak-hickory forests of West Virginia. Proceedings of the National Wild Turkey Symposium 4:213-224.

The purpose of this study was to define forest characteristics important to wild turkey broods to aid forest wildlife biologists in making better management recommendations to forest managers. Seventeen radio-tagged females with broods were monitored between April-September. Broods used white oak timber stands, wildlife clearings, and pastures most often

while avoiding pine and chestnut oak stands and clearcut areas. Habitats with >23 m^2/ha basal area were avoided and mean stand diameter did not influence use. Although use of open areas was demonstrated by broods, this was dismissed by noting broods actually spent more time in forested areas. Large home range sizes were concluded to be a function of limited food. Recommendations for management did not include creating more openings, but rather thinning forest stands to promote more herbaceous understory growth.

Paisley, R. N., R. G. Wright, and J. F. Kubisiak. 1996. Use of agricultural habitats and foods by wild turkeys in southwestern Wisconsin. Proceedings of the National Wild Turkey Symposium 7:69-73.

Complaints that wild turkeys were causing damage to agricultural crops prompted this study to determine use of agricultural habitats and foods in Wisconsin. Radio-collared female turkeys were monitored during summer and fall. Food habits were determined by collecting digestive tracts from turkeys observed feeding at least 20 minutes in crop fields. During fall, digestive tracts were collected from hunter harvested birds. Females generally used crop fields more in the summer than fall. During summer, females with broods used crop fields more and forested areas less than females without broods. This data is counter to that presented in earlier works (see Wright et al. 1989) Agricultural foods made up 69% (mostly waste corn) of the spring diet. No corn seedlings were consumed. Other crops consumed included alfalfa, oat seeds, and soybeans. During summer, brood flocks consumed mostly grasshoppers (68%) with poults consuming more animal matter than adults (77% vs. 4%). Adult females consumed more oat seeds than did poults (65% vs. 23%). Agricultural crops dominated fall diets (49%) with waste corn accounting for 39% of the total volume. It was suggested that a poor production of hard mast contributed to the low occurrence (12%) of this food item during fall. The authors concluded that agricultural habitats were important to wild turkeys, and that although damage to crops likely occurs the consumption of agricultural crops is low.

Palmer, W. E., G. A. Hurst, and B. D. Leopold. 1996. Pre-incubation habitat use by wild turkey hens in central Mississippi. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 50:417-427.

Porter, W. F. 1977. Utilization of agricultural habitats by wild turkeys in southeastern Minnesota. International Congress of Game Biologists 13:319-323.

Thirty-five radio-collared wild turkeys were monitored to determine the importance of agricultural habitats. Habitat cover types were determined from aerial photos and classified by dominant vegetation. Turkeys spent most of their diurnal time in deciduous hardwoods and agricultural habitats in all seasons. Corn fields were the agricultural areas used during winter, but hayfields and pastures were the agricultural habitats used most often during spring and summer. Although total area is not reported, most of the agricultural habitat was hay fields and fallowed fields. The author concluded that agricultural habitats are essential to successful wild turkey management.

_____. 1980. An evaluation of wild turkey brood habitat in southeastern Minnesota. Proceedings of the National Wild Turkey Symposium 4:203-212.

This study was designed to identify important habitat characteristics for brood rearing wild turkeys in southeastern Minnesota. Radio-tagged female turkeys were monitored during nesting to determine hatching date and females with broods were followed during 4 and 12 week intervals. Habitat use was determined from cover maps of the study area. Brood flocks had

summer ranges of 250 ha, although movements were restricted during the first 4 weeks. Ravine-hardwood and upland-agriculture were used during 90% of the diurnal period. On average, brood flocks spent 45% of the time in agricultural areas with peak use during week 7. The amount of time spent in agricultural areas was greater in this study than previously reported by other investigators, thus challenging the conventional wisdom that turkeys require large expanses of forest with few openings. The high protein availability in alfalfa fields and complex physical structure of the plant community provide adequate food and cover for wild turkey broods.

Price, K. D., J. E. Ebinger, and R. D. Andrews. 1984. Analysis of Illinois wild turkey habitat. Transactions of the Illinois Academy of Science 77:197-201.

This was a study of wild turkey habitat in Alexander, Calhoun, Jackson, and Union counties in southern Illinois. Study areas were determined from observations provided by turkey hunters at spring harvest check stations. Habitats were characterized from aerial photos and area calculated using a polar planimeter. Forest areas were surveyed for composition, basal area, dominance, and frequency of tree species. These data were used to calculate an importance value (IV; sensu McIntosh, R. P. 1957). The York Woods. A case history of forest succession in southern Wisconsin. Ecology 38:29-37 and Boggess, W. R. 1964. Trelease Woods, Champaign County, Illinois: woody vegetation and stand composition. Transactions of the Illinois Academy of Science 57:261-271). Alexander, Jackson, and Union counties had more forest and less cultivated land than Calhoun County. Forest areas surveyed were dominated by white oak (IV = 23.2-102.3) and hickories (IV = 21.9-80.5). The understory was comprised mainly of sugar maple (IV = 21.9-80.5) and flowering dogwood (IV = 9.1-51.9). All areas surveyed contained habitat suitable for wild turkeys. All forest areas sampled were in close proximity to agricultural fields and forest openings. Unfortunately, many of the discussion points and conclusions are not based on the data gathered, but the paper does provide some descriptions of historic forest composition in southern Illinois.

Rolley, R. E., J. F. Kubisiak, R. N. Paisley, and R. G. Wright. 1998. Wild turkey population dynamics in southwestern Wisconsin. Journal of Wildlife Management 62:917-925.

Ross, A. S, and G. A. Wunz. 1990. Habitat used by wild turkey hens during summer in oak forests in Pennsylvania. Proceedings of the National Wild Turkey Symposium 6:39-43.

This study examined habitat use by wild turkey broods in an area where forest openings and herbaceous ground vegetation were scarce. Females with broods chose habitats with a denser tree canopy, less woody ground cover, and denser herbaceous ground cover than was available. Adult females with broods were found most often in bottomlands with low slopes; subadult females with broods were found most often in upland sites. Female turkeys were able to successfully raise broods in areas with few clearings, but broods were commonly found in or near these clearings.

Speake, D. W., T. E. Lynch, W. J. Fleming, G. A. Wright, and W. J. Hamrick. 1975. Habitat use and seasonal movements of wild turkeys in the southeast. Proceedings of the National Wild Turkey Symposium 3:122-130.

Swanson, D. A., J. C. Pack, C. I. Taylor, P. W. Brown, and D. E. Samuel. 1994. Habitat use of wild turkey hens in northwestern West Virginia. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 48:123-133.

Vander Haegen, W. M., M. W. Sayre, and J. E. Cardoza. 1991. Nesting and brood rearing habitat use in a northern wild turkey population. Transactions of the Northeast Section of The Wildlife Society 48:113-119.

Objectives of this study were to characterize vegetation structure at wild turkey nest sites and determine habitat use of turkey broods in a landscape dominated by agriculture. Most nests were placed in forested habitats, with ground cover averaging 30.3 cm in height with 40% cover. Nests in croplands and old fields were concealed in dense herbaceous vegetation. Radio-tagged female turkeys with broods were monitored to determine habitat use. Most habitats were not used in proportion to availability. Young broods used croplands and old fields more than forested areas, whereas older broods used cropland and mixed-wood habitats. Nest site selection was related to cover and brood-rearing habitat. Nesting near brood rearing habitat may be energetically advantageous especially for late hatching broods. Agricultural areas may be important for brood rearing for the food and cover they provide to poults while allowing adults the opportunity to watch for predators.

Vangilder, L. D., and E. W. Kurzejeski. 1995. Population ecology of the eastern wild turkey in northern Missouri. Wildlife Monographs 130:1-50.

Williams, M. W., D. B. Gibbs, T. H. Roberts, and D. L. Combs. 1997. Habitat use by wild turkey broods in Tennessee. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 51:457-466.

Radio-tagged female wild turkeys with broods were monitored between May-August to determine habitats in western Tennessee important for brood rearing. Invertebrates were collected in bottomland hardwood and open areas (mostly old pastures dominated by fescue (*Festuca arundinacea*) to determine food availability. Females with broods used bottomland hardwood most during the 4 weeks following hatching, followed by upland hardwoods, openings, and bottomland pines. Upland hardwoods ranked highest in use when broods were >4 weeks, followed by upland pine, bottomland hardwood, and openings; however, the amount of use did not differ between these habitat types. Invertebrate biomass was greater in openings than bottomland hardwood. Bottomland hardwoods appear to be an important component to females when rearing broods, which is contrary to previously published research. Although invertebrate biomass was lower in bottomland hardwood, it was probably sufficient to met the energetic demands of poults. Forested areas containing low-growing herbaceous vegetation, which provides concealment from predators, may be more important than food abundance to female turkeys with young poults.

Wright, R. G., R. N. Paisley, and J. F. Kubisiak. 1989. Farmland habitat use by wild turkeys in Wisconsin. Proceedings of the Eastern Wildlife Damage Control Conference 4:120-126.

This study was initiated to address concerns regarding crop depredation by wild turkeys in Wisconsin. Radio collared turkeys were monitored between May-August to determine use of crop fields, non-crop fields, and forestland. Summer food habits were determined by collecting crops and gizzards from birds observed feeding in crop fields for at least 30 minutes. Overall results suggest that use of crop fields is lower than use of forestland. Females with broods used crop fields most (13%), followed by males (7%), and broodless females (6%). However, females with broods used non-crop fields in greater proportion than was available. Three adult females and 15 poults were collected for food habits analysis. Adult females fed mostly on plant matter (79%) which consisted mostly of oats (53%), alfalfa (13%), and other wild plants (13%). Poult

crops contained mostly animal matter (87%), but also contained oats (9%) and other wild plants (2%). Habitat use data supported previous research; however, unlike other food habit studies, the data suggested brood flocks in Wisconsin were more dependent on animal matter.

Wunz, G. A. 1990. Relationship of wild turkey populations to clearings created for brood habitat in oak forests in Pennsylvania. Proceedings of the National Wild Turkey Symposium 6:32-38.

This well-designed 20-year study looked at the importance of forest openings as habitat for wild turkey broods. Baseline data was collected for 5 years on 2 78 km^2 forested areas. Clearings were created on 1 area and the other area served as a control during years 5-10. During years 10-15 the initial control area became the treatment area and vice versa. A third area was also used with baseline data collected and control and treatment areas used on east and west halves of the area, then switched at year 10. Although turkey populations were monitored in years 15-20 it was unclear if any experimental areas were maintained. Wild turkeys were monitored using radio telemetry, surveillance cameras, and periodic site inspections. Turkey sign was observed in almost all clearings. Use of clearings increased as much as 56% during spring and summer. Clearings used most by turkey broods had moderate grass cover bordered by shrubs or low overhead canopy cover. Summer and winter population surveys indicated more turkeys were using areas with clearings than areas without clearings. Other factors, such as tree loss from gypsy moth infestation and human disturbance from building construction and fuelwood cutting, complicated associating increasing wild turkey densities with forest clearings.

HOME RANGE

Day, K. S., L. D. Flake, and W. L. Tucker. 1991. Movements and habitat use by wild turkey hens with broods in a grassland-woodland mosaic in the northern plains. Prairie Naturalist 23:73-83.

See annotation in habitat use section.

Hayden, A. H. 1979. Home range and habitat preferences of wild turkey broods in northern Pennsylvania. Transactions of the Northeast Fish and Wildlife Conference 36:76-87.

See annotation in habitat use section.

Kurzejeski, E. W, and J. B. Lewis. 1990. Home ranges, movements, and habitat use of wild turkey hens in northern Missouri. Proceedings of the National Wild Turkey Symposium 6:67-71.

See annotation in habitat use section.

Porter, W. F. 1977. Home range dynamics of wild turkeys in southeastern Minnesota. Journal of Wildlife Management 41:434-437.

Radio-collared turkeys were monitored to determine home range movements. Winter home ranges were smallest for all sex and age classes. Movements increased during spring, with home ranges as much as 10 times larger than in winter. Movement during spring was smallest by adult males and largest by juvenile females. Home ranges of females with broods increased

throughout summer (June through August). The author concluded that winter home range was restricted by snow depth. Reproductive behavior influenced spring movements. Movements by females with broods was in response to food resources. A weakness of this paper was the small sample sizes used to determine home range (*n* ranged between 1-5 birds).

Rolley, R. E., J. F. Kubisiak, R. N. Paisley, and R. G. Wright. 1998. Wild turkey population dynamics in southwestern Wisconsin. Journal of Wildlife Management 62:917-925.

Speake, D. W., T. E. Lynch, W. J. Fleming, G. A. Wright, and W. J. Hamrick. 1975. Habitat use and seasonal movements of wild turkeys in the southeast. Proceedings of the National Wild Turkey Symposium 3:122-130.

Vangilder, L. D., and E. W. Kurzejeski. 1995. Population ecology of the eastern wild turkey in northern Missouri. Wildlife Monographs 130:1-50.

Wigley, T. B., J. M. Sweeney, M. E. Garner, and M. A. Melchoirs. 1986. Wild turkey home ranges in the Ouachita Mountains. Journal of Wildlife Management 50:540-544.

POPULATION MONITORING

Cobb, D. T., D. L. Francis, and R. W. Etters. 1996. Validating a wild turkey population survey using cameras and infrared sensors. Proceedings of the National Wild Turkey Symposium 7:213-218.

The Florida Game and Freshwater Fish Commission used TrailMaster® cameras with infrared sensors to validate their Bait Station Transect Survey (BSTS) method of population monitoring. Cameras were set in such a way that all turkeys entering the survey area were photographed; therefore, the camera counts were considered complete population counts. Bait Station Transect Survey protocol established a 7-day pre-survey baiting period, followed by a 14-day survey period. Visits during BSTS overlapped slightly with peak use periods documented by cameras. Photographs documented 154 unique visits, whereas BSTS only documented turkeys on 7 of 70 visits. Most individuals photographed could be identified to age and sex. Surveys suggest that a 7-day sampling period is adequate to index turkey populations. Bait Station Transect Surveys did not provide the data to adequately determine turkey populations. Visibility of vehicles and surveyors were probably the cause of low turkey counts from the BSTS method. Cameras with infrared sensors can be a powerful tool to validate current survey methods or as a substitute to collect population data.

Kimmel, R. O., J. H. Poate, and M. R. Riggs. 1996. Spatial handling of wild turkey survey data using geographic information system mapping procedures. Proceedings of the National Wild Turkey Symposium 7:219-223.

INTERNET SITES WITH INFORMATION ABOUT CROP DAMAGE BY TURKEYS AND OTHER WILDLIFE. ALL URLS WERE ACTIVE AS OF JUNE 2003.

http://www.dnr.state.wi.us/org/land/wildlife/hunt/turkey/crpdmge.htm

Link to Internet Center for Wildlife Damage Management.

http://www.exnet.iastate.edu/Publications/PM1302F.pdf

Managing Iowa Wildlife: Wild Turkeys.

Gives biology and management information. Addresses crop depredation issues and provides line drawings for wildlife crop damage by turkeys and other species.

http://birddamage.com/turkeys.html

This site offers "3 non-harmful ways to control turkeys" with their deterrent products.

http://www.state.nd.us/lr/99memos/19005.html

Prepared by the North Dakota Legislative Council staff for the Agriculture Committee July 1999.

Addresses damage caused by wild game and hunters. There is a small section that deals specifically with turkey damage, but most of the damage is "feeding and defecating on feed piles." Provides information about how other states deal with wildlife damage problems.

http://www.dnr.state.wi.us/org/land/wildlife/damage/

Wisconsin Department of Natural Resources wildlife damage page. Provides information on different animal damage programs.

http://www.wildlifedamagecontrol.com/turkeycontrol.htm

Describes a few circumstances of turkeys in suburban situations.

http://www.berrymaninstitute.org/internetpubs.htm#birds

A good site with links to general animal damage documents, but none specific to turkeys.

http://www.ext.usu.edu/publica/natrpubs.htm

This site contains links to several different wildlife damage publications. There are species-specific links are useful for providing descriptions of damage.

http://www.ext.usu.edu/publica/natrpubs/pest3.pdf

This is an online version of the Utah Vertebrate Pest Control Study Manual. It does not contain information about turkeys; however, it does provide descriptions of the damage caused by other birds, as well as mammals.

ATTACHMENT

GREENE 2003

ATTACHMENT

TYPES AND DESCRIPTIONS OF CROP DAMAGE IN ILLINOIS

Occasionally, wild turkeys damage specialty crops, turfgrass, or ornamental flowers that may have higher value than common agricultural crops. We also investigated effects wild turkeys may have on other species of wildlife and found no evidence of widespread negative effects.Â We conducted a literature review to determine real and perceived damage caused by wild turkeys in North America. Wild turkeys can cause damage to agricultural crops, such as corn (Zea mays L.), soybeans (Glycine max [L.] Merrill), wheat, and hay crops but the majority of actual damage is usually minor or caused by other wildlife, thus estimates of damage by wild turkeys often are inflated. Records of the crop wild relatives of 80 crop gene pools can be queried and visualized in this interactive map: http://www.cwrdiversity.org/distribution-map/ This dataset was assembled as part of the project â€˜Adapting Agriculture to Climate Change: Collecting, Protecting and Preparing Crop Wild Relativesâ€™, which is supported by the Government of Norway.Â Crop Wild Relatives Occurrence data consortia originator International Center for Tropical Agriculture (CIAT) CO email: cropwildrelatives@croptrust.org homepage: http://www.cwrdiversity.org/. metadata author GBIF Norway NO email: helpdesk@gbif.no homepage: http://www.gbif.no. Christian Svindseth user position: GBIF Norway Helpdesk GBIF Norway NO email: christian.svindseth@nhm.uio.no homepage: http://www.gbif.no. Wild turkeys cause little damage to row crops in Illinois. C. D. Greene, C. Nielsen, A. Woolf, K. S. Delahunt, J. Nawrot. Geography. 2010. Similar to much of the agricultural Midwest, Eastern wild turkey (Meleagris gallopavo silvestris) populations have increased considerably in Illinois, making them more visible to landowners andâ€¦ Expand. 3.Â Investigations of crop damage by wild turkeys in illinois. A. Woolf, C. D. Greene. Biology. Wild turkeys have a â€œpecking orderâ€ of dominance and may view people or pets who act fearful as underlings, chasing them or blocking the entrance to homes or cars. If a wild turkey (or a flock of turkeys) has invaded your yard, driveway, or neighborhood, itâ€™s important that you establish your dominance by hazing the turkey(s). Itâ€™s easy to scare turkeys away by making noises (try waving your arms and yelling or blowing a whistle), popping open an umbrella, throwing tennis balls, or dousing the turkey with. water from a hose or squirt gun. A leashed dog may also be effective in scaring a turkey...Â Most of the crop and garden damage blamed on wild turkeys is actually caused by other animals (such as raccoons, groundhogs, foxes, deer, or squirrels).

The plan covers wild turkey release, population management, human interactions and habitat. Download PDF.Â Investigations of landowner complaints about turkeys in Ontario and elsewhere have shown that in most cases no damage has occurred or the damage has been caused by other species of wildlife. This chapter contains basic information on human-turkey conflicts, including a general summary of scientific research results on the topic, followed by information and strategies for preventing conflicts or mitigating conflicts when they do occur.Â 1996). Crop damage research in Ohio found that turkeys were often blamed for damage caused by deer, raccoons, squirrels, chipmunks, mice, groundhogs, and crows (Swanson et al. INVESTIGATIONS OF CROP DAMAGE BY WILD TURKEYS IN ILLINOIS, Alan Woolf and Christian D. Greene. PDF. HABITAT PREFERENCES OF MIGRATORY SHOREBIRDS AND WATERFOWL ON THE EAST SHORELINE OF REND LAKE REFUGE, Alan Woolf, Jack R. Nawrot, Laura Kirk, and Elise Elliot-Smith.Â RELATIVE ABUNDANCE OF BEAVERS IN ILLINOIS, Alan Woolf, Thomas Nelson, Michael Barbour, Matthew Bowyer, Stanley T. McTaggart, and Jimmy Waddell. PDF. COOPERATIVE UPLAND WILDLIFE RESEARCH AND SURVEYS, Alan Woolf, Wayne E. Thogmartin, and Whitney Weber. Submissions from 2001 2001. PDF. READ PAPER. Understanding wild turkeys and crop damage. Download. Understanding wild turkeys and crop damage. Roger Applegate. Loading Preview. Sorry, preview is currently unavailable. You can download the paper by clicking the button above. Download pdf. Ã—Close. Log In. Log In with Facebook. Log In with Google. Sign Up with Apple. or. In Illinois, the wild turkey breeding season begins in late March to early April, with the peak of the incubation period occurring in late April to early May. However, nests can be found throughout the summer, as hens that lose clutches to predation, human disturbance, or weather events often renest. Photo: Adele Hodde, IDNR.Â Farmers are often concerned about crop damage caused by wild turkeys. While wild turkeys do sometimes damage corn, soybeans, and small grains (i.e., winter wheat or oats), researchers in Indiana found that a majority of wildlife-related crop damage is caused by the nocturnal feeding of raccoons, white-tailed deer, and small mammals. This coincided with a heavy oak mast crop in parts of Illinois (Clark county included) thereby giving turkeys little reason to find and use bait sites. To prepare us for next year's trapping season, we have purchased additional nets in "diamond" and "standard" configurations, and an ATV. We are hopeful that this will enable use to maintain more bait sites and be more flexible in selecting potential trap sites.Â Annual Report: Forest wildlife surveys and investigations, study II: Population Studies of wild turkeys. Illinois Dept. Natur.